

Mineral Contents of Mango Seed Kernels

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Abstract: The mineral analysis of four commercially grown mango varieties (Maldah, Anwar Retaul, Chounsa and Dusehri) included quantitative estimations of the macronutrients and micronutrients were carried out. These results showed that K range was (1.14-1.63g %), Ca (0.1075-1.1125g %), Na (0.0575-0.1375g %). The contents (mg/100g) of other minerals *i.e.*, Zn, Bi, Sr, Pb, Cd, Mn, Co, Cr, Fe, Cu and Ni were in range of (6.10-10.20), (5.50-6.65), (1.60-1.65), (1.30-1.70), (0.70-1.20), (0.70-1.00), (0.30-0.60), (0.35-0.70), (0.20-1.55), (0.05-0.65) and (0.05-0.35) respectively. The variations in the contents of different minerals may be due to the change in soil composition, climatic conditions and varietal differences in parent trees. However, present studies are helpful to assess the food value of mango seed kernels particularly with regard to mineral contents.

Key words: Mango seed kernels, mineral contents

Introduction

Among the major fruits, mango (*Mangifera indica*) occupies the second most important position after citrus in terms of area and production. It is a high value crop that gives a good cash return. The review of literature indicates that mango yields in Pakistan are quite low, which ranges between 8–9 t ha⁻¹ considerably less than world yield 25 t ha⁻¹. (Souco, 1993). The gap between potential and actual yield is very wide due to poor management practices and post harvest losses (Tariq, 1994). Since independence, the cultivation of mango in Pakistan has increased in major areas of Multan, Bahawalpur, D. G. Khan, Khairpur and Hyderabad Divisions. There is a great demand for quality grafted mangoes in Pakistan. It is also desirable to bring more area under mango cultivation (Butta and Ahmed, 1994).

With expanded production distribution and consumption of mango fruits, it necessary to get knowledge about the chemical composition of mango fruits and its seeds. Number of mango varieties are produced in Pakistan especially in Punjab. Multan Division is an important region for producing such varieties. Investigations about the chemical composition of mango fruits and its seed kernels have been carried out in different countries (Uptin, 1996). Unfortunately, data for complete chemical analysis of mango seed kernels is not available in Pakistan.

The climatic conditions and nature of soil have considerable influence on the chemical composition of mango fruits and its seeds. We are therefore, prompted to investigate the seed kernels of different mango varieties grown in Multan Division, Pakistan. The present study deals with the mineral composition of seed kernels of four different mango varieties.

Materials and Methods

Sampling: The experiment was conducted in the Department of Chemistry, Bahauddin Zakariya University, Multan during 1996-1997. The ripe fruits of four mangoes varieties namely, Dusehri, Malda, Anwar Retaul and Chounsa were collected from the growers in Multan region. The peel and pulpe were separated. The stones were dried in shadow and disintegrated manually to get the kernels. These were ground in a food grinder separately and also dried at 100°C for 1 hour. The

material was defatted using n-hexane as solvent.

Ash Contents: For estimating the total ash contents, 1 gram of powdered, dried and defatted mango seed kernels was weighed in China dish. The material was ignited in a muffle furnace (RJM 1.8-10, China) at 550°C until a white or light gray ash was obtained and weight became constant.

Elemental Analysis.

Reagents and Standards: Analytical Reagent Grade chemicals supplied by Merck were used without further purification for the purpose of elemental analysis. De-ionised water was used to prepare standard and solutions. Stock standard solution (1000 ppm) of each element was prepared by dissolving the required amount of respective salt in de-ionised water. The measuring ranges of standard solutions in 0.1 M HNO₃ were prepared from respective stock solutions.

Analytical Procedure: The ash contents obtained from 1 g of defatted mango seed kernels were digested in *aqua regia* (3 mL) and heated up to dryness. The residues were dissolved in 1M HNO₃ (5mL), filtered into measuring flasks (50mL) separately and volumes were made up to mark by adding de-ionised water in each case. These solutions and standard solutions were aspirated into Atomic Absorption Spectrophotometer A-1800 (Hitachi, Japan) and absorbance measurements were made for each element using specific instrumental conditions (Table 1) for flame atomisation mode. The amount of each element in the samples was determined from calibration curves (Fig. 1). Analysis of each sample was made in triplicate.

Results and Discussion

Seed kernels of four mango varieties *i.e.* Anwar Retaul, Chounsa, Dusehri and Maldah had been analysed for mineral contents.

The ash contents of mango seed kernels were obtained by incineration of samples in muffle furnace at elevated temperature (550°C). The results are given in Table 2. The ash contents were found higher in Anwar Retaul and Maldah (5g %) but lower in case of Dusehri. The ash contents in Chounsa was found to be 4 g %.

Table 1: Standard Analytical Conditions for AAS Analysis

Element	Wavelength (nm)	HCl Current (mA)	Slit Width	Type of Flame	Fuel Flow Rate
Pb	283.3	7.5	1.3	Air H ₂ C ₂	2.3
Ni	232.0	10.0	0.2	-do-	2.2
Cr	357.0	7.5	1.3	-do-	2.6
Fe	284.3	10.0	0.2	-do-	2.3
Co	240.7	10.0	0.2	-do-	2.5
Mn	279.6	7.5	0.4	-do-	2.3
Cu	224.7	7.5	1.3	-do-	2.3
Na	589.2	10.0	2.6	-do-	2.0
K	285.2	7.5	0.4	-do-	2.2
Zn	213.8	10.0	1.3	-do-	2.0
Ca	422.7	0.4	0.4	-do-	2.5
Mg	285.7	0.4	0.4	-do-	2.0
Cd	228.8	1.3	1.3	-do-	2.2

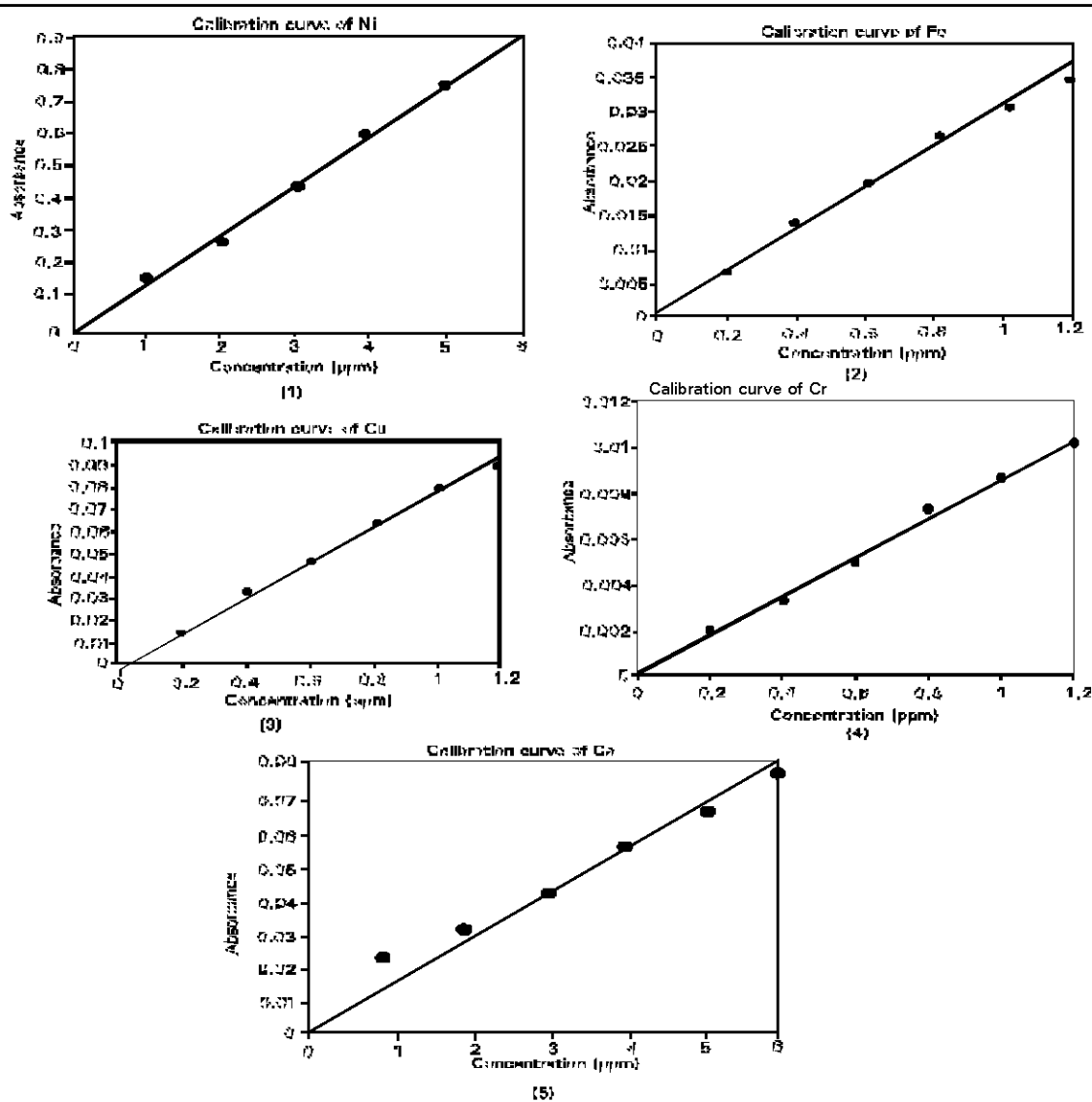


Fig. 1: Calibration graphs for different methods

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Table 2: Ash contents of mango seed kernels

S.No.	Mango variety	Ash content [*] (g%)
1	Anwar Retaul	5
2	Maldah	5
3	Chaunsa	4
4	Dusehri	3

* Average of three replications

The quantitative analysis of mineral contents (Macro and micro-nutrients) in mango seed kernels was carried out by Atomic Absorption Spectrophotometry. The results are given in Tables 3 & 4 and explained below.

Table 3 shows that the contents of macro nutrients *i.e.*, K, Ca and Na were found in the range of 1.14-1.16, 0.1075-1.1125 and 0.0575-0.1375 g % respectively in the seed kernels of the four mango varieties. The contents of K and Na were higher in case of Anwar Retaul. Ca contents were found to be higher in case of Dusehri and low in case of Madah. Mg was not quantified in all the mango varieties.

Table 3: Total Estimation of Macronutrients in Seed Kernels of Mango Varieties

Metal	Mango Varieties (g % of defatted material)*			
	Maldah	Anwar Retaul	Chaunsa	Dusehri
K	1.4900	1.6300	1.1400	1.4200
Ca	0.1075	0.4925	0.5675	1.1125
Na	0.0925	0.1375	0.1125	0.0575
Mg	N.Q.	N.Q.	N.Q.	N.Q.

N.Q. = Not Quantify, * Average of three replications.

Table 4 shows the contents (mg/100g) of micro-nutrients *i.e.*; Ba, Zn, Bi, Sr, Pb, Cd, Mn, Co, Cr, Fe, Cu and Ni. The ranges of occurrence of various micro nutrients were as follow: Ba, 38-80.50; Zn, 3.45-10.20; Bi, 5.50-6.65; Sr, 1.60-1.65; Pb, 1.30-1.70; Cd, 0.70-1.20; Mn, 0.70-1.00; Co, 0.30-0.60; Cr, Fe, 0.20-1.55; Cu, 0.05-0.65 and Ni, 0.05-0.35. It was observed that range of occurrence was very wide for the metals in the seed kernels of the mango varieties. In case of some metals the difference was more than 10 times. It was also observed that the Ba was the most prominent in occurrence followed by Zn, Bi, Sr, and Pb in decreasing order. Cu and Ni contents were relatively much less than the contents of other metals.

Table 4: Total Estimation of Micronutrients in Seed Kernels of Mango Varieties.

Metal	Mango Varieties (mg\100g of defatted material)*			
	Maldah	Anwar Retaul	Chaunsa	Dusehri
Ba	47.30	80.50	77.70	38.90
Zn	6.15	10.20	6.15	3.45
Bi	6.00	5.70	5.50	6.65
Sr	1.60	1.60	1.65	1.65
Pb	1.50	1.50	1.70	1.30
Cd	1.20	0.90	0.80	0.70
Mn	0.75	1.00	0.90	0.70
Co	0.60	0.55	0.35	0.30
Cr	0.35	0.50	0.70	0.50
Fe	0.25	0.40	0.20	1.55
Cu	0.10	0.65	0.05	0.30
Ni	0.35	0.05	0.10	0.10

* Average of three replications.

Our results are more or less comparable with those reported in literature (Dhingra *et al.*; 1948 and Lasztity *et al.*; 1988). The variations in the contents of different minerals may be due to the change in soil composition, climatic conditions and varietal differences in parent trees. However, present studies are helpful to assess the food value of mango seed kernels particularly with regard to mineral contents.

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